

### Amendments to the Claims

This listing of claims will replace all prior versions and listings of claims in the above-identified application.

## **Listing of Claims**

1. (Currently amended) A method comprising:  
  
identifying a plurality of nodes with resources, wherein said nodes with resources are comprised in an optical network and have a resource necessary to support a virtual path, wherein said identifying said plurality of nodes with resources comprises  
  
receiving, from a candidate node, information indicating that said candidate node has sufficient resources available to support said virtual path, wherein  
  
said candidate node is configured to determine whether said  
  
candidate node has sufficient resources available to support  
  
said virtual path; and  
  
identifying an alternate physical path using a result of said identifying said plurality of nodes with resources, said alternate physical path comprising ones of said nodes with resources.
2. (Original) The method of claim 1, further comprising:  
  
restoring said virtual path using said alternate physical path.

3. (Currently amended) The method of claim 2, wherein ~~said candidate node is configured to determine whether said candidate node has sufficient resources to support said virtual path, and~~ said restoring is done by

configuring said alternate physical path by establishing a communication connection between said ones of said nodes with resources; and  
provisioning said virtual path over said alternate physical path.

4. (Previously presented) The method of claim 2, further comprising:

detecting a failure in said virtual path; wherein

said detection of said failure is done by receiving a failure message packet;

said virtual path is provisioned on a physical path between a first and a second node of said optical network;

said optical network comprises nodes, and said nodes comprise said nodes with resources;

each one of said nodes is coupled to at least one other of said nodes by a plurality of optical links;

said physical path between said first and said second node comprises a plurality of intermediate nodes; and

each one of said nodes is coupled to at least one other of said nodes in a mesh topology.

5. (Original) The method of claim 4, wherein said restoring of said virtual path is completed in less than 2 seconds.

6. (Original) The method of claim 4, wherein said restoring of said virtual path is completed in less than 250 milliseconds.

7. (Original) The method of claim 4, wherein said first node receives said failure message packet.

8. (Previously presented) The method of claim 7, further comprising:
  - (i) changing a state of said virtual path to restoring;
  - (ii) identifying an adjacent node with required bandwidth for said virtual path;
  - (iii) forwarding a resource request packet to said adjacent node with required bandwidth for said virtual path;
  - (iv) waiting for a resource response packet for a predetermined time interval; andif said resource response packet is not received within said predetermined time interval, repeating steps (ii) – (iv) for a predefined threshold time.
9. (Original) The method of claim 8, further comprising:  
if said resource response packet is not received within said predefined threshold time, generating a network alarm.
10. (Original) The method of claim 8, further comprising:  
if said resource response packet is received with at least one error,  
waiting until responses to all resource request packets are received; and  
if said resource response packet is received with no errors,  
determining if a list of allocated ports in said resource response packet is valid.
11. (Original) The method of claim 10, further comprising:  
if said list of allocated port is valid,  
provisioning said virtual path on said allocated ports; and  
if said list of allocated ports is invalid,  
generating a network alarm.

12. (Original) The method of claim 10, further comprising:  
if responses to all resource request packets are received with at least one error,  
generating a network alarm.
13. (Previously presented) The method of claim 9, wherein said predetermined time interval and predefined threshold time are dynamically calculated by said network.
14. (Original) The method of claim 4, wherein one of said intermediate nodes receives said failure message.
15. (Original) The method of claim 14, further comprising:  
changing a state of said virtual path to down;  
forwarding said failure message to adjacent nodes comprising said virtual path;  
initiating a timer for receiving a response to said forwarded failure message;  
if said timer expires before said response to said forwarded failure message is received,  
releasing resources of said virtual path; and  
if said response to said forwarded failure message is received before said timer expires,  
stopping said timer, and  
releasing resources of said virtual path.
16. (Original) The method of claim 4, wherein said second node receives said failure message.
17. (Original) The method of claim 16, further comprising:  
acknowledging said failure message;  
changing a state of said virtual path to down; and  
releasing resources of said virtual path.

18. (Previously presented) The method of claim 8, wherein one of said intermediate nodes receives said resource request packet.

19. (Original) The method of claim 18, further comprising:

if said resource request packet includes at least one error,

copying said resource request packet to a first resource response packet,

decrementing a hop count field in said first resource response packet,

adding an error code to said first resource response packet, and

responding with said first resource response packet; and

if said resource request packet includes no errors,

allocating a resource to said virtual path,

incrementing a hop count field in said resource request packet,

forwarding said resource request packet to an adjacent node having a resource  
necessary to support said virtual path, and

waiting for a second resource response packet from said adjacent node.

20. (Previously presented) The method of claim 19, further comprising:

if said second resource response packet is not received within a second predetermined  
time interval,

releasing said resource allocated to said virtual path, and

forwarding a negative acknowledgment to said first node.

21. (Previously presented) The method of claim 19, further comprising:
- if said second resource response packet is received with at least one error,
    - releasing said resource allocated to said virtual path,
    - decrementing a hop count field in said second resource response packet, and
    - forwarding said second resource response packet to said first node; and
  - if said second resource response packet is received with no errors,
    - determining if said second resource response packet includes a valid list of a plurality of ports.
22. (Original) The method of claim 21, further comprising:
- if said list of said plurality of ports is invalid,
    - releasing resources allocated to said virtual path, and
    - forwarding a negative acknowledgement to said first node;
  - if said list of said plurality of ports is valid,
    - determining if said plurality of ports is available;
  - if said plurality of ports is available,
    - assigning said plurality of ports to said virtual path, and
    - updating said virtual path information in a node database;
  - if said plurality of ports is not available,
    - adding an error code to said second resource response packet;
  - decrementing a hop count field in said second resource response packet; and
  - forwarding said second resource response packet to said first node.

23. (Original) The method of claim 18, further comprising:  
if a state of said virtual path is one of 'restoring' and 'deleting',  
copying said resource request packet to said first resource response packet,  
decrementing said hop count field in said first resource response packet,  
adding an error code of to said first resource response packet, and  
responding with said first resource response packet.
24. (Original) The method of claim 8, wherein said second node receives said resource request packet.
25. (Original) The method of claim 24, further comprising:  
if said resource request packet includes invalid information,  
copying said resource request packet to a third resource response packet,  
decrementing a hop count field in said third resource response packet,  
adding an error code to said third resource response packet, and  
responding with said third resource response packet; and  
if said resource request packet includes valid information,  
determining if a resource is available for said virtual path.
26. (Original) The method of claim 25, further comprising:  
if said resource is available for said virtual path,  
copying said resource request packet to said third resource response packet,  
allocating said resource to said virtual path,  
updating said virtual path information in a node database,  
decrementing a hop count field in said third resource response packet,

adding a list of a plurality of ports to said third resource response packet, and  
responding with said third resource response packet.

27. (Original) The method of claim 25, further comprising:

if said resource is not available for said virtual path,

copying said resource request packet to said third resource response packet,  
decrementing said hop count field in said third resource response packet,  
adding an error code to said third resource response packet, and  
responding with said third resource response packet.

28. (Original) The method of claim 24, further comprising:

if a state of said virtual path is one of 'restoring' and 'deleting',

copying said resource request packet to said third resource response packet,  
decrementing said hop count field in said third resource response packet,  
adding an error code to said third resource response packet, and  
responding with said third resource response packet.



29. **(Currently amended)** A network element comprising:
- a processor configured to restore a virtual path in an optical network;
  - a memory coupled to said processor; and
  - a network interface coupled to said processor; **wherein**
- said processor **is** configured to
- receive, from a candidate node, an indication that said candidate node**  
**has sufficient resources available to support said virtual path,**  
**and**
- identify, **based at least in part on said received indication,** a plurality of  
nodes with resources, **wherein**
- said candidate node is configured to determine whether said candidate node**  
**has said sufficient resources available to support said virtual path,**
- said nodes with resources are comprised in said optical network and have a  
resource necessary to support said virtual path, ~~wherein to identify said~~  
~~plurality of nodes with resources said processor is configured to~~  
~~determine whether a candidate node comprising said processor has~~  
~~sufficient resources to support said virtual path,~~ and
- said processor is further configured to** identify an alternate physical path ~~using~~  
~~a result of said identifying said plurality of nodes with resources,~~ said  
alternate physical path comprising ones of said nodes with resources.
30. **(Original)** The network element of claim 29, wherein said processor is further  
configured to
- restore said virtual path using said alternate physical path.

31. (Original) The network element of claim 29, wherein said processor is further configured to
- configure said alternate physical path by establishing a communication connection between said ones of said nodes with resources; and
- provision said virtual path over said alternate physical path.
32. (Previously presented) The network element of claim 29, wherein said processor is further configured to
- detect a failure in said virtual path; wherein
- said detection of said failure is done by receiving a failure message packet;
- said virtual path is provisioned on a physical path between a first and a second node of said optical network;
- said optical network comprises nodes, and said nodes comprise said nodes with resources;
- each one of said nodes is coupled to at least one other of said nodes by a plurality of optical links;
- said physical path between said first and said second node comprises a plurality of intermediate nodes; and
- each one of said nodes is coupled to at least one other of said nodes in a mesh topology.
33. (Original) The network element of claim 32, wherein said processor is further configured to restore said virtual path in less than 2 seconds.
34. (Original) The network element of claim 32, wherein said processor is further configured to restore said virtual path in less than 250 milliseconds.

35. (Previously presented) The network element of claim 32, wherein  
said network element is configured as said first node; and  
said network element is configured to receive said failure message packet.
36. (Previously presented) The network element of claim 35, wherein said processor is further configured to
- (i) change a state of said virtual path to restoring;
  - (ii) identify an adjacent node with required bandwidth for said virtual path;
  - (iii) forward a resource request packet to said adjacent node with required bandwidth for said virtual path;
  - (iv) wait for a resource response packet for a predetermined time interval; and
  - (v) if said resource response packet is not received within said predetermined time interval, repeat steps (ii) – (iv) for a predefined threshold time.
37. (Original) The network element of claim 36, wherein said processor is further configured to
- if said resource response packet is not received within said predefined threshold time,  
generate a network alarm.
38. (Original) The network element of claim 36, wherein said processor is further configured to
- if said resource response packet is received with at least one error,  
wait until responses to all resource request packets are received; and  
if said resource response packet is received with no errors,  
determine if a list of allocated ports in said resource response packet is valid.

39. (Original) The network element of claim 38, wherein said processor is further configured to

if said list of allocated port is valid,

provision said virtual path on said allocated ports; and

if said list of allocated ports is invalid,

generate a network alarm.

40. (Original) The network element of claim 38, wherein said processor is further configured to

if responses to all resource request packets are received with at least one error,

generate a network alarm.

41. (Previously presented) The network element of claim 39, wherein said predetermined time interval and predefined threshold time are dynamically calculated by said network.

42. (Previously presented) The network element of claim 32, wherein  
said network element is configured as one of said intermediate nodes, and  
said network element is configured to receive said failure message packet.

43. (Original) The network element of claim 42, wherein said processor is further configured to

change a state of said virtual path to down;

forward said failure message to adjacent nodes comprising said virtual path;

initiate a timer for receiving a response to said forwarded failure message;

if said timer expires before said response to said forwarded failure message is received,

release resources of said virtual path; and

if said response to said forwarded failure message is received before said timer expires,  
stop said timer, and  
release resources of said virtual path.

44. (Previously presented) The network element of claim 32, wherein  
said network element is configured as said second node, and  
said network element receives said failure message.
45. (Original) The network element of claim 44, wherein said processor is further  
configured to  
acknowledge said failure message;  
change a state of said virtual path to down; and  
release resources of said virtual path.
46. (Original) The network element of claim 36, wherein  
said network element is configured as one of said intermediate nodes, and  
said network element receives said resource request packet.
47. (Original) The network element of claim 46, wherein said processor is further  
configured to  
if said resource request packet includes at least one error,  
copy said resource request packet to a first resource response packet,  
decrement a hop count field in said first resource response packet,  
add an error code to said first resource response packet, and  
respond with said first resource response packet; and  
if said resource request packet includes no errors,

allocate a resource to said virtual path,  
increment a hop count field in said resource request packet,  
forward said resource request packet to an adjacent node having a resource  
necessary to support said virtual path, and  
wait for a second resource response packet from said adjacent node.

48. (Previously presented) The network element of claim 47, wherein said processor is further configured to

if said second resource response packet is not received within a second predetermined time interval,  
release said resource allocated to said virtual path, and  
forward a negative acknowledgment to said first node.

49. (Original) The network element of claim 47, wherein said processor is further configured to

if said second resource response packet is received with at least one error,  
release said resources allocated to said virtual path,  
decrement a hop count field in said second resource response packet, and  
forward said second resource response packet to said first node; and  
if said second resource response packet is received with no errors,  
determine if said second resource response packet includes a valid list of a plurality of ports.

50. (Original) The network element of claim 49, wherein said processor is further configured to

if said list of said plurality of ports is invalid,  
release resources allocated to said virtual path, and

forward a negative acknowledgement to said first node;  
if said list of said plurality of ports is valid,  
determine if said plurality of ports is available;  
if said plurality of ports is available,  
assign said plurality of ports to said virtual path, and  
update said virtual path information in a node database;  
if said plurality of ports is not available,  
add an error code to said second resource response packet;  
decrement a hop count field in said second resource response packet; and  
forward said second resource response packet to said first node.

51. (Original) The network element of claim 46, wherein said processor is further configured to

if a state of said virtual path is one of 'restoring' and 'deleting',  
copy said resource request packet to said first resource response packet,  
decrement said hop count field in said first resource response packet,  
add an error code of to said first resource response packet, and  
respond with said first resource response packet.

52. (Previously presented) The network element of claim 36, wherein  
said network element is configured as said second node, and  
said network element is configured to receive said resource request packet.

53. (Original) The network element of claim 52, wherein said processor is further configured to

if said resource request packet includes invalid information,

copy said resource request packet to a third resource response packet,

decrement a hop count field in said third resource response packet,

add an error code to said third resource response packet, and

respond with said third resource response packet; and

if said resource request packet includes valid information,

determine if a resource is available for said virtual path.

54. (Original) The network element of claim 53, wherein said processor is further configured to

if said resource is available for said virtual path,

copy said resource request packet to said third resource response packet,

allocate said resource to said virtual path,

update said virtual path information in a node database,

decrement a hop count field in said third resource response packet,

add a list of a plurality of ports to said third resource response packet, and

respond with said third resource response packet.



55. (Original) The network element of claim 53, wherein said processor is further configured to

if said resource is not available for said virtual path,

copy said resource request packet to said third resource response packet,

decrement said hop count field in said third resource response packet,

add an error code to said third resource response packet, and

respond with said third resource response packet.

56. (Original) The network element of claim 52, wherein said processor is further configured to

if a state of said virtual path is one of 'restoring' and 'deleting',

copy said resource request packet to said third resource response packet,

decrement said hop count field in said third resource response packet,

add an error code to said third resource response packet, and

respond with said third resource response packet.

57. (Currently amended) A computer system comprising:

means for identifying a plurality of nodes with resources, wherein said nodes with resources are comprised in an optical network and have a resource necessary to support a virtual path, said means for identifying said plurality of nodes with resources comprising[[:]]

means for receiving, from a candidate node, information indicating that said candidate node has sufficient resources **available** to support said virtual path, **wherein**

**said candidate node is configured to determine whether said candidate node has sufficient resources available to support said virtual path;** and

means for identifying an alternate physical path using a result of said identifying said plurality of nodes with resources, said alternate physical path comprising ones of said nodes with resources.

58. (Original) The computer system of claim 57, further comprising:

means for restoring said virtual path using said alternate physical path.

59. (Previously presented) The computer system of claim 57, wherein said means for restoring comprises:

means for configuring said alternate physical path by establishing a communication connection between said ones of said nodes with resources; and

means for provisioning said virtual path over said alternate physical path.

60. (Previously presented) The computer system of claim 58, further comprising:  
means for detecting a failure in said virtual path; wherein  
said detection of said failure is done by receiving a failure message packet;  
said virtual path is provisioned on a physical path between a first and a second node of  
said optical network;  
said optical network comprises nodes, and said nodes comprise said nodes with  
resources;  
each one of said nodes is coupled to at least one other of said nodes by a plurality of  
optical links;  
said physical path between said first and said second node comprises a plurality of  
intermediate nodes; and  
each one of said nodes is coupled to at least one other of said nodes in a mesh topology.
61. (Original) The computer system of claim 60, wherein said restoring of said virtual path is  
completed in less than 2 seconds.
62. (Original) The computer system of claim 60, wherein said restoring of said virtual path is  
completed in less than 250 milliseconds.
63. (Original) The computer system of claim 60, wherein said first node receives said failure  
message packet.

64. (Previously presented) The computer system of claim 63, further comprising:
- (i) means for changing a state of said virtual path to restoring;
  - (ii) means for identifying an adjacent node with required bandwidth for said virtual path;
  - (iii) means for forwarding a resource request packet to said adjacent node with required bandwidth for said virtual path;
  - (iv) means for waiting for a resource response packet for a predetermined time interval; and
- means for repeating actions of said means (ii) – (iv) for a predefined threshold time if said resource response packet is not received within said predetermined time interval.
65. (Original) The computer system of claim 64, further comprising:
- means for generating a network alarm if said resource response packet is not received within said predefined threshold time.
66. (Original) The computer system of claim 64, further comprising:
- means for waiting until responses to all resource request packets are received if said resource response packet is received with at least one error; and
- means for determining if a list of allocated ports in said resource response packet is valid if said resource response packet is received with no errors.
67. (Original) The computer system of claim 66, further comprising:
- means for provisioning said virtual path on said allocated ports if said list of allocated port is valid; and
- means for generating a network alarm if said list of allocated ports is invalid.

68. (Original) The computer system of claim 66, further comprising:  
means for generating a network alarm if responses to all resource request packets are received with at least one error.
69. (Previously presented) The computer system of claim 65, wherein said predetermined time interval and predefined threshold time are dynamically calculated by said network.
70. (Original) The computer system of claim 60, wherein one of said intermediate nodes receives said failure message.
71. (Original) The computer system of claim 70, further comprising:  
means for changing a state of said virtual path to down;  
means for forwarding said failure message to adjacent nodes comprising said virtual path;  
means for initiating a timer for receiving a response to said forwarded failure message;  
means for releasing resources of said virtual path if said timer expires before said response to said forwarded failure message is received;  
means for stopping said timer if said response to said forwarded failure message is received before said timer expires; and  
means for releasing resources of said virtual path if said response to said forwarded failure message is received before said timer expires.

72. (Original) The computer system of claim 60, wherein said second node receives said failure message.
73. (Original) The computer system of claim 72, further comprising:  
means for acknowledging said failure message;  
means for changing a state of said virtual path to down; and  
means for releasing resources of said virtual path.
74. (Original) The computer system of claim 64, wherein one of said intermediate nodes receives said resource request packet.
75. (Original) The computer system of claim 74, further comprising:  
means for copying said resource request packet to a first resource response packet if said resource request packet includes at least one error;  
means for decrementing a hop count field in said first resource response packet if said resource request packet includes at least one error;  
means for adding an error code to said first resource response packet if said resource request packet includes at least one error;  
means for responding with said first resource response packet if said resource request packet includes at least one error;  
means for allocating a resource to said virtual path if said resource request packet includes no errors;  
means for incrementing a hop count field in said resource request packet if said resource request packet includes no errors;  
means for forwarding said resource request packet to an adjacent node having a resource necessary to support said virtual path if said resource request packet includes no errors; and

means for waiting for a second resource response packet from said adjacent node if said resource request packet includes no errors.

76. (Previously presented) The computer system of claim 75, further comprising:

means for releasing said resource allocated to said virtual path if said second resource response packet is not received within a second predetermined time interval; and

means for forwarding a negative acknowledgment to said first node if said second resource response packet is not received within said second predetermined time interval.

77. (Original) The computer system of claim 75, further comprising:

means for releasing said resources allocated to said virtual path if said second resource response packet is received with at least one error;

means for decrementing a hop count field in said second resource response packet if said second resource response packet is received with at least one error;

means for forwarding said second resource response packet to said first node if said second resource response packet is received with at least one error; and

means for determining if said second resource response packet includes a valid list of a plurality of ports if said second resource response packet is received with no errors.

78. (Original) The computer system of claim 77, further comprising:

means for releasing resources allocated to said virtual path if said list of said plurality of ports is invalid;

means for forwarding a negative acknowledgement to said first node if said list of said plurality of ports is invalid;

means for determining if said plurality of ports is available if said list of said plurality of ports is valid;

means for assigning said plurality of ports to said virtual path if said plurality of ports is available;

means for updating said virtual path information in a node database if said plurality of ports is available;

means for adding an error code to said second resource response packet if said plurality of ports is not available;

means for decrementing a hop count field in said second resource response packet; and

means for forwarding said second resource response packet to said first node.

79. (Original) The computer system of claim 74, further comprising:

means for copying said resource request packet to said first resource response packet if a state of said virtual path is one of 'restoring' and 'deleting';

means for decrementing said hop count field in said first resource response packet if a state of said virtual path is one of 'restoring' and 'deleting';

means for adding an error code of to said first resource response packet if a state of said virtual path is one of 'restoring' and 'deleting'; and

means for responding with said first resource response packet if a state of said virtual path is one of 'restoring' and 'deleting'.

80. (Original) The computer system of claim 64, wherein said second node receives said resource request packet.

81. (Original) The computer system of claim 80, further comprising:

means for copying said resource request packet to a third resource response packet if said resource request packet includes invalid information;

means for decrementing a hop count field in said third resource response packet if said resource request packet includes invalid information;



means for adding an error code to said third resource response packet if said resource request packet includes invalid information;

means for responding with said third resource response packet if said resource request packet includes invalid information; and

means for determining if a resource is available for said virtual path if said resource request packet includes valid information.

82. (Original) The computer system of claim 81, further comprising:

means for copying said resource request packet to said third resource response packet if said resource is available for said virtual path;

means for allocating said resource to said virtual path if said resource is available for said virtual path;

means for updating said virtual path information in a node database if said resource is available for said virtual path;

means for decrementing a hop count field in said third resource response packet if said resource is available for said virtual path;

means for adding a list of a plurality of ports to said third resource response packet if said resource is available for said virtual path; and

means for responding with said third resource response packet.

83. (Original) The computer system of claim 81, further comprising:

means for copying said resource request packet to said third resource response packet if said resource is not available for said virtual path;

means for decrementing said hop count field in said third resource response packet if said resource is not available for said virtual path;

means for adding an error code to said third resource response packet if said resource is not available for said virtual path; and

means for responding with said third resource response packet.

84. (Original) The computer system of claim 80, further comprising:

means for copying said resource request packet to said third resource response packet if a state of said virtual path is one of 'restoring' and 'deleting';

means for decrementing said hop count field in said third resource response packet if a state of said virtual path is one of 'restoring' and 'deleting';

means for adding an error code to said third resource response packet if a state of said virtual path is one of 'restoring' and 'deleting'; and

means for responding with said third resource response packet.

85. (Currently amended) A computer program product encoded in computer readable storage media, said program product comprising a set of instructions executable on a computer system, said set of instructions configured to cause said computer system to

receive, from a candidate node, an indication that said candidate node has sufficient resources available to support said virtual path, and

identify, based at least in part on said indication, a plurality of nodes with resources, wherein

said candidate node is configured to determine whether said candidate node has said sufficient resources available to support said virtual path,

said nodes with resources are comprised in an optical network and have a resource necessary to support a virtual path, ~~wherein to identify said plurality of nodes with resources said instructions are configured to determine whether a candidate node comprising said computer system has sufficient resources to support said virtual path;~~ and

identify an alternate physical path ~~using a result of said identifying said plurality of nodes with resources,~~ said alternate physical path comprising ones of said nodes with resources.

86. (Original) The computer program product of claim 85, wherein said set of instructions is further configured to

restore said virtual path using said alternate physical path.

87. (Original) The computer program product of claim 85, wherein said set of instructions is further configured to

configure said alternate physical path by establishing a communication connection  
between said ones of said nodes with resources; and  
provision said virtual path over said alternate physical path.

88. (Previously presented) The computer program product of claim 85, wherein said set of instructions is further configured to

detect a failure in said virtual path; wherein  
said detection of said failure is done by receiving a failure message packet;  
said virtual path is provisioned on a physical path between a first and a second node of  
said optical network;  
said optical network comprises nodes, and said nodes comprise said nodes with  
resources;  
each one of said nodes is coupled to at least one other of said nodes by a plurality of  
optical links;  
said physical path between said first and said second node comprises a plurality of  
intermediate nodes; and  
each one of said nodes is coupled to at least one other of said nodes in a mesh topology.

89. (Original) The computer program product of claim 88, wherein said set of instructions is further configured to restore said virtual path in less than 2 seconds.

90. (Original) The computer program product of claim 88, wherein said set of instructions is further configured to restore said virtual path in less than 250 milliseconds.

91. (Previously presented) The computer program product of claim 88, wherein said first node receives said failure message packet.

92. (Previously presented) The computer program product of claim 91, wherein said set of instructions is further configured to

- (i) change a state of said virtual path to restoring;
- (ii) identify an adjacent node with required bandwidth for said virtual path;
- (iii) forward a resource request packet to said adjacent node with required bandwidth for said virtual path;
- (iv) wait for a resource response packet for a predetermined time interval; and
- (v) if said resource response packet is not received within said predetermined time interval, repeat steps (ii) – (iv) for a predefined threshold time.

93. (Original) The computer program product of claim 92, wherein said set of instructions is further configured to

if said resource response packet is not received within said predefined threshold time,  
generate a network alarm.

94. (Previously presented) The computer program product of claim 92, wherein said set of instructions is further configured to

if said resource response packet is received with at least one error,  
wait until responses to all resource request packets are received; and  
if said resource response packet is received with no errors,  
determine if a list of allocated ports in said resource response packet is valid.

95. (Original) The computer program product of claim 94, wherein said set of instructions is further configured to

if said list of allocated port is valid,

provision said virtual path on said allocated ports; and

if said list of allocated ports is invalid,

generate a network alarm.

96. (Original) The computer program product of claim 93, wherein said set of instructions is further configured to

if responses to all resource request packets are received with at least one error,

generate a network alarm.

97. (Previously presented) The computer program product of claim 92, wherein said predetermined time interval and predefined threshold time are dynamically calculated by said network.

98. (Original) The computer program product of claim 88, wherein one of said intermediate nodes receives said failure message.

99. (Original) The computer program product of claim 88, wherein said set of instructions is further configured to

change a state of said virtual path to down;

forward said failure message to adjacent nodes comprising said virtual path;

initiate a timer for receiving a response to said forwarded failure message;

if said timer expires before said response to said forwarded failure message is received,

release resources of said virtual path; and

if said response to said forwarded failure message is received before said timer expires,

stop said timer, and  
release resources of said virtual path.

100. (Original) The computer program product of claim 88, wherein said second node receives said failure message.

101. (Original) The computer program product of claim 100, wherein said set of instructions is further configured to

acknowledge said failure message;  
change a state of said virtual path to down; and  
release resources of said virtual path.

102. (Original) The computer program product of claim 92, wherein one of said intermediate nodes receives said resource request packet.

103. (Original) The computer program product of claim 92, wherein said set of instructions is further configured to

if said resource request packet includes at least one error,  
copy said resource request packet to a first resource response packet,  
decrement a hop count field in said first resource response packet,  
add an error code to said first resource response packet, and  
respond with said first resource response packet; and  
if said resource request packet includes no errors,  
allocate a resource to said virtual path,  
increment a hop count field in said resource request packet,

forward said resource request packet to an adjacent node having a resource necessary to support said virtual path, and  
wait for a second resource response packet from said adjacent node.

104. (Previously presented) The computer program product of claim 103, wherein said set of instructions is further configured to

if said second resource response packet is not received within a second predetermined time interval,  
release said resource allocated to said virtual path, and  
forward a negative acknowledgment to said first node.

105. (Original) The computer program product of claim 103, wherein said set of instructions is further configured to

if said second resource response packet is received with at least one error,  
release said resources allocated to said virtual path,  
decrement a hop count field in said second resource response packet, and  
forward said second resource response packet to said first node; and  
if said second resource response packet is received with no errors,  
determine if said second resource response packet includes a valid list of a plurality of ports.

106. (Original) The computer program product of claim 105, wherein said set of instructions is further configured to

if said list of said plurality of ports is invalid,  
release resources allocated to said virtual path, and  
forward a negative acknowledgement to said first node;  
if said list of said plurality of ports is valid,

determine if said plurality of ports is available;  
if said plurality of ports is available,  
    assign said plurality of ports to said virtual path, and  
    update said virtual path information in a node database;  
if said plurality of ports is not available,  
    add an error code to said second resource response packet;  
decrement a hop count field in said second resource response packet; and  
forward said second resource response packet to said first node.

107. (Original) The computer program product of claim 102, wherein said set of instructions is further configured to

if a state of said virtual path is one of 'restoring' and 'deleting',  
    copy said resource request packet to said first resource response packet,  
    decrement said hop count field in said first resource response packet,  
    add an error code of to said first resource response packet, and  
    respond with said first resource response packet.

108. (Original) The computer program product of claim 92, wherein said second node receives said resource request packet.

109. (Original) The computer program product of claim 108, wherein said set of instructions is further configured to

if said resource request packet includes invalid information,  
    copy said resource request packet to a third resource response packet,  
    decrement a hop count field in said third resource response packet,  
    add an error code to said third resource response packet, and



respond with said third resource response packet; and  
if said resource request packet includes valid information,  
determine if a resource is available for said virtual path.

110. (Original) The computer program product of claim 109, wherein said set of instructions is further configured to

if said resource is available for said virtual path,  
copy said resource request packet to said third resource response packet,  
allocate said resource to said virtual path,  
update said virtual path information in a node database,  
decrement a hop count field in said third resource response packet,  
add a list of a plurality of ports to said third resource response packet, and  
respond with said third resource response packet.

111. (Original) The computer program product of claim 108, wherein said set of instructions is further configured to

if said resource is not available for said virtual path,  
copy said resource request packet to said third resource response packet,  
decrement said hop count field in said third resource response packet,  
add an error code to said third resource response packet, and  
respond with said third resource response packet.

112. (Previously presented) The computer program product of claim 108, wherein said set of instructions is further configured to

if a state of said virtual path is one of ‘restoring’ and ‘deleting’,  
copy said resource request packet to said third resource response packet,  
decrement said hop count field in said third resource response packet,  
add an error code to said third resource response packet, and  
respond with said third resource response packet.

113. (Previously presented) A network element configured to restore a virtual path in an optical network, said network element comprising:

a processor;  
a memory coupled to said processor; and  
a network interface coupled to said processor; said processor configured to  
identify a plurality of nodes with resources, wherein said nodes with resources are  
comprised in said optical network and have a resource necessary to  
support said virtual path,  
identify an alternate physical path, said alternate physical path comprising ones of  
said nodes with resources,  
detect a failure in said virtual path,  
change a state of said virtual path to restoring,  
(i) identify an adjacent node with required bandwidth for said virtual path,  
(ii) forward a resource request packet to said adjacent node with required  
bandwidth for said virtual path,  
(iii) wait for a resource response packet for a predetermined time interval, and  
if said resource response packet is not received within said predetermined time  
interval, repeat steps (i)–(iii) for a predefined threshold time;

wherein,  
said detection of said failure is done by receiving a failure message packet;  
said virtual path is provisioned on a physical path between a first and a second node of  
said optical network;  
said optical network comprises nodes, and said nodes comprise said nodes with  
resources;  
each one of said nodes is coupled to at least one other of said nodes by a plurality of  
optical links;  
said physical path between said first and said second node comprises a plurality of  
intermediate nodes;  
each one of said nodes is coupled to at least one other of said nodes in a mesh topology;  
said network element is configured as said first node; and  
said network element is configured to receive said failure message packet.

114. **(Currently amended)** The method of claim 1, wherein said identifying said plurality of nodes with resources comprises determining whether a node under consideration would be appropriate for use in restoring said virtual path by virtue of having sufficient resources **available** to support a physical path to be used by said virtual path.

115. (Previously presented) The method of claim 114, wherein said resources comprise an available bandwidth.

116. (Previously presented) The method of claim 114, wherein said resources comprise an available port.

117. (Previously presented) The method of claim 114, wherein said resources comprise an available class of service.

118. (Canceled)

119. **(Currently amended)** The method of claim 1, wherein said identifying said plurality of nodes with resources comprises rejecting a candidate node if said candidate node does not have sufficient resources **available** to support said virtual path.

120. (Canceled)

121. **(Canceled)**

122. **(Currently amended)** The method of ~~claim 121~~ **claim 126**, wherein said initiating a subsequent failure measure comprises generating a network alarm.

123. (Canceled)

124. (Previously presented) The computer system of claim 57, wherein said means for identifying a plurality of nodes with resources is comprised in said candidate node.

125. (Previously presented) The method of claim 1, further comprising:  
in response to detecting a failure in said virtual path, forwarding a resource request to an adjacent node; and  
waiting for a predefined time for a response to said resource request.

126. (Previously presented) The method of claim 125, further comprising:  
if said response to said resource request is not received within said predefined time,  
initiating a subsequent failure measure.

127. **(Currently amended)** The method of claim 1, wherein said identifying said alternate physical path comprises:

identifying said alternate physical path based **at least in part** on a list of allocated ports **received from said candidate node.** ~~in said resource response packet.~~

128. **(New)** The network element of claim 29, wherein said processor is configured to:

identify said alternate physical path based at least in part on a list of allocated ports received from said candidate node.

129. **(New)** The computer system of claim 57, wherein said means for identifying said alternate physical path is configured to identify said alternate physical path based at least in part on a list of allocated ports received from said candidate node.

130. **(New)** The computer program product of claim 85, wherein said set of instructions is configured to

identify said alternate physical path based at least in part on a list of allocated ports received from said candidate node.